FAA AVIATION NEWS

OCTOBER 1973

COVER:
A simple anti-collision system that is not just for the birds.
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FAA AVIATION NEWS

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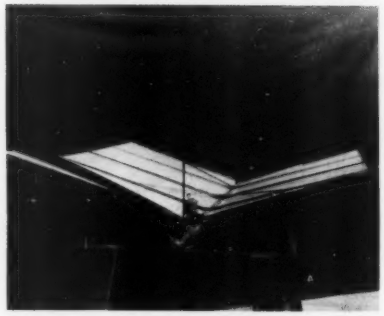

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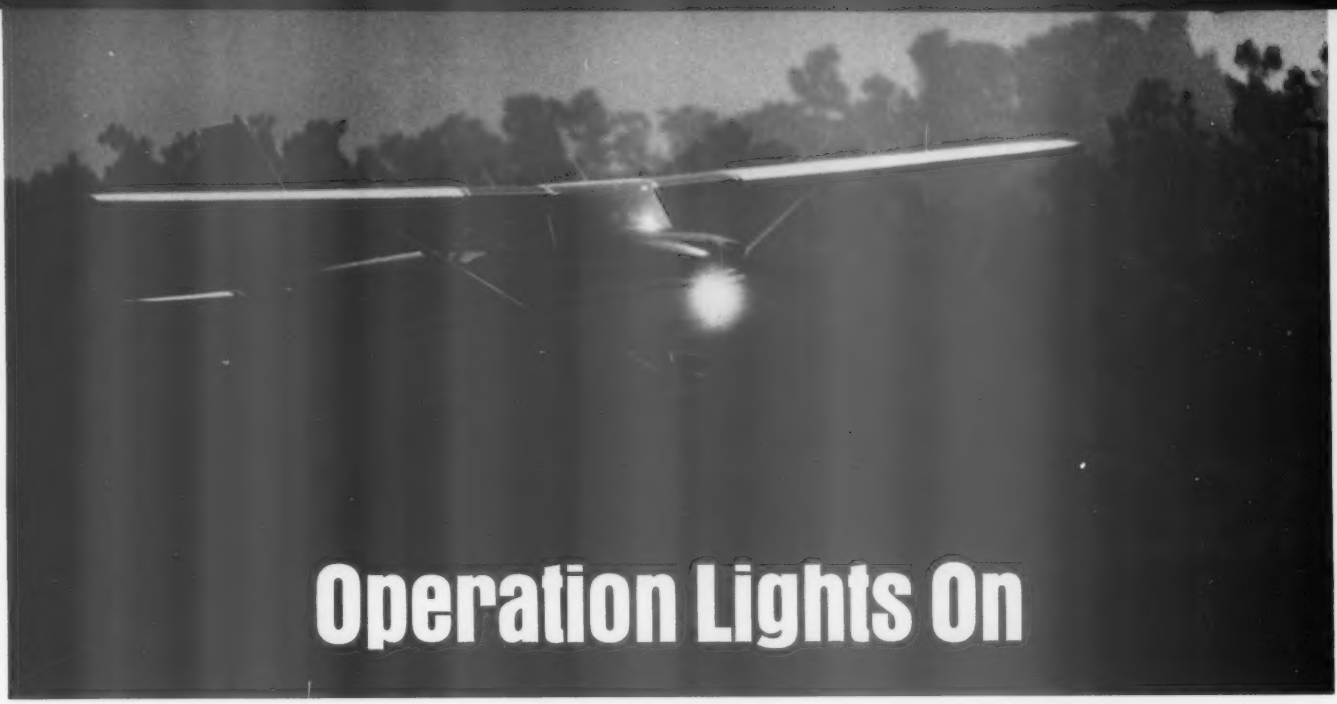


Operation Lights On

Using your landing lights may help Jonathan and other pilots see and avoid you

Ever since airplanes began sharing the air with birds, pilots have been trying to figure out a way to avoid colliding with their feathered counterparts in mid-air. There now appears to be some evidence that at least part of the answer may lie in making the aircraft easier to see, so that the *birds* can avoid the *airplanes*—rather than vice versa.

Although research on this subject is still considered too limited to form a basis for rule-making, pilots are being requested by FAA to participate voluntarily in "Operation Lights On," a program for increasing the daytime conspicuity of airplanes in flight. (Pilots historically have a very strong personal interest in avoiding *all* other flying objects.)

The use of daytime airplane lighting was originally tested in the Dallas/Tarrant County area of Texas as a means of enabling pilots to spot other aircraft in flight more readily. The Director of FAA's Southwest Region, Henry L. Newman, found that pilot response warranted nationwide application of the program, in the interest of reducing the potential for midair collisions.

At the same time, evidence accumulating from investigators of bird behavior, both in the United States and in Canada, has indicated that birds are better able to see and avoid aircraft in the daytime when bright lights, such as landing lights, are on. There are documented instances when flying birds have been seen to turn back from crossing in front of lighted aircraft. In each case the pilot involved was convinced that the landing lights caused the birds to take successful evasive action.

Bird strike incidents are not frequent in this country, but they can be deadly. Strikes occur both during the migratory seasons and in the off-season. The *Learjet* which crashed shortly after takeoff at Atlanta's DeKalb-Peachtree Airport last spring, killing seven persons, ran into a local flock of starlings. Other aircraft have been disabled by geese or ducks smashing through the windshield. Over the period 1964 through 1971, 54 bird strike incidents were reported to the National Transportation Safety Board. In the first six months of 1973, there were 24 bird strikes to military aircraft. A 1¼ ounce swift forced down an F-111 jet fighter over Zion National Park.

While research in learning how to track and predict the movements of bird flocks goes on at an increasing pace, and while efforts are being made constantly to educate airport management to the dangers of practices which attract birds to the vicinity of airports, the fact remains that the hazard of bird strikes will probably never be completely eliminated. "Operation Lights On," however, does give pilots an opportunity to minimize the chances of wildfowl straying into their flight path, and at the same time assists other pilots to maintain a safe separation in an environment that is increasingly plagued with polluted, smoggy air.

It is worth your while to avoid bird strikes. A two-pound bird like a seagull crashing into a light plane flying at 200 mph could exert a force of 8,000 pounds. If the craft is a 600 mph jet the force could be 72,000 pounds.

FAA recommends that you turn on landing lights when operating:

- Within ten miles of any airport, day or night.
- Under reduced visibility, as in haze, dusk, smog, etc.
- Under special VFR conditions, where such operation is allowed.
- Where flocks of birds may be expected (in coastal areas, near swamps, lakes, refuse dumps, bird sanctuaries, migratory flyways, etc.).

In addition, pilots are asked to use anti-collision lights (rotating beacons) whenever the engines are running, day or night.

Some fixed base operators have voiced the concern that careless renters of aircraft will run down the battery by forgetting to turn off lights after landing. Although turning off the master switch at engine shutdown normally cuts off all drain on the battery, it may be a good practice to incorporate a lights-off step into the shutdown checklist, and thus prevent the off-chance possibility of running down the battery through a short in the wires.

Similarly, the pre-flight check should include testing all lights before departure, and wiping them clean. Whether you are sharing hazy air with a flock of feathered friends or a brace of wide-bodied jets, you'll feel a lot better knowing that your lamps are bright and clear.

Light up and be seen!

Stall/Spin Accidents

A young student pilot, the mother of two children, was making a solo approach to the South Weymouth, Mass., Airport on a clear afternoon in September of 1969. Suddenly the right wing went down and the airplane lost altitude. The plane cut through some trees one mile west of the airport, then crashed violently, exploding into flames, killing the pilot.

In November of that same year a 49-year old dentist-pilot was taking off in the early afternoon for a pleasure flight from the Barron, Wisc., airport. His small four-seater had two teenage boys on board as passengers. In the process of making a normal takeoff, at about 20 feet off the ground, the pilot started to retract the landing gear. He had some difficulty in trying to latch the landing gear in the gear-up position, and as he looked down to see what was wrong with the device, he allowed the nose to dip toward the ground, then pulled up abruptly. A few seconds later the plane slammed into a cow pasture 450 yards past the end of the runway with the engine running at full throttle. The pilot, who had 550 hours of total time and 400 in type, was killed instantly, and one of the boys died the following day in a hospital. The other 16-year old miraculously escaped from this accident with only a fractured wrist.

And in July of that same year an IFR pilot with a commercial rating and over 2,000 hours of flying time took off from a private airstrip near Valley Center, Kansas, on a business trip to Wichita. While still climbing, he went into a steeply banked left turn, and the nose and the left wing suddenly dropped. The plane went down into a wheat field and ploughed through it for 300 feet until bursting into flames. Fatal to one.

These three fatal accidents happened to pilots of widely varying degrees of experience, in different phases of flight, but they have one element in common—the all too common stall. A National Transportation Safety Board special study of stall/spin accidents involving small fixed-wing aircraft between 1967 and 1969 notes that the 1,261 stall/spin accidents occurring during that period accounted for 23½ percent of all serious or fatal accidents. (NTSB lists all stall and spin accidents collectively. All stalls do not culminate in spins, but an aircraft must be stalled before it will spin.)

In the early periods of aviation, stall/spin accidents were more frequent than they have been recently, due to the narrow margin that existed between maximum airspeed and stall speed in many of the early aircraft. However, NTSB makes the somber prediction that stall/spin accidents will increase disturbingly during the next decade—in part because the total number of flying hours in general aviation is rising but more significantly because "the trend toward modern-day, high performance aircraft has resulted in spin characteristics considerably less favorable than those associated with predecessor aircraft."

In simpler terms, a modern high performance airplane, once in a spin, may be more reluctant to recover than yesterday's model: but why?

Formerly, general aviation aircraft had a "high lift" type of airfoil, or wing, designed for maximum lift at lower airspeeds. Such airfoils are capable of generating lift even at a zero angle of attack, according to the principle known as Bernouilli's Theorem, which establishes that when a fluid or gas is in motion (as air passing over or under a wing), the pressure decreases as the speed is increased. The "high lift" wing sections use this principle by providing a curved upper surface and a nearly flat bottom surface. The air mass which strikes the leading edge of the airfoil is required to travel faster and farther over the upper surface than beneath the wing, causing a reduced pressure above the wing which gives the desired lift.

Positive Angle

The more efficient, aerodynamically, *high speed* wing sections characteristic of most of today's airplanes have nearly identical curvatures on both upper and lower surfaces, which means that a zero angle of attack may give you zero lift. Such planes must be flown at a positive angle of attack at all times, simply to maintain altitude. However, in any airfoil, as the angle of attack is increased toward the critical point, the separation of turbulent air reduces lift.

At high cruising speeds, the positive angle of attack required is quite small. But as airspeed is decreased, the angle of attack necessary to provide lift increases rapidly toward the critical point. This is one reason why the ability to fly the airplane properly at minimum controllable airspeeds is stressed so much today by FAA inspectors and by knowledgeable flight instructors.

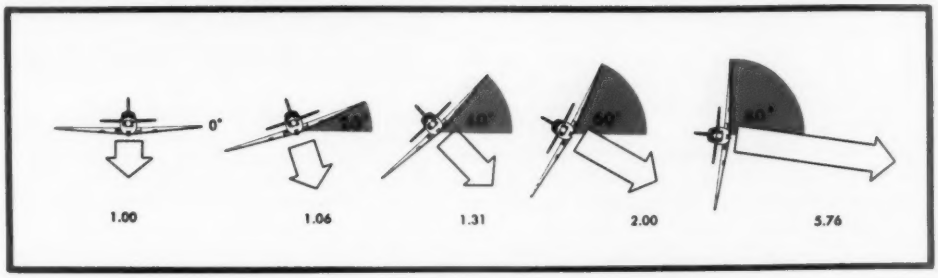
Stall speed, of course, is always raised when the aircraft wing is banked, since banking increases the total load factor of the airplane. (The load factor is the result of gravity forces plus any centrifugal forces acting on the airplane.) In shallow turns of 30° or less, the additional load factor imposed by the centrifugal force of the turn is almost negligible—only 0.154 at a 30 degree bank angle. Any steeper bank raises the load factor from centrifugal forces very sharply. At 45° the total load factor is 1.414 and at 60° it is 2.0.

The load factor for any airplane maintaining level flight with a constant angle of bank is the same, regardless of airspeed; the load factor, for example, in a 60° bank is always 2.0 G's, regardless of airspeed or aircraft type. You can calculate the stall speed for any airplane at any degree of bank if you understand that normal stalling speed increases always in proportion to the *square root of the load factor*. In the 60 degree bank angle cited above, the load factor is 2.0 G's, the square root is 1.415: if the airplane is a Cessna 172 with a normal stalling speed of 57 mph, it will stall at 81 mph in a 60° bank.

In simpler terms, it may help to remember that a 60 degree bank could raise your stalling speed by nearly 50 percent. Careful pilots carry a safe-over-stall margin of airspeed whenever executing turns, especially near the ground.

Some of the more common misconceptions about stalls involve a confusion of the two terms, *pitch attitude* and *angle of attack*. Pitch attitude is the angle formed by the

Size of white arrows and figures beneath show how wing load factor increases with bank angle.



-Power Off- **STALLING SPEEDS** MPH — CAS

Gross Weight 1600 lbs. / CONDITION	ANGLE OF BANK 0°	20°	40°	60°
Flaps UP	55	57	63	78
Flaps 20°	49	51	56	70
Flaps 40°	48	49	54	67

Stall speed varies with flaps and bank angle.

longitudinal axis of the airplane with respect to the horizon—when the nose of the airplane points at the horizon, the pitch attitude is always zero, regardless of which direction the airplane is moving in, whether it is climbing or descending, etc. The angle of attack is "the acute angle between the chord of an airfoil (essentially the wing) and the relative wind." This has nothing necessarily to do with the horizon. It is possible (by excessive backpressure on the elevator) to produce a high angle of attack in an airplane which is pointing toward the ground, toward the horizon, or toward the moon. *An airplane may be stalled at any attitude if the critical angle of attack is exceeded.*

Other points of confusion regarding stalls:

• Must an airplane have a relatively low airspeed in order to stall? No! An airplane may be stalled at any airspeed, if the critical angle of attack is exceeded.

• Does weight and balance affect the stall speed of an airplane? Yes! Weight added to an aircraft requires that it be operated at a higher angle of attack to support that weight; therefore the critical angle of attack, or point of stall, will occur at a higher airspeed. When the center of gravity is moved forward in the airplane the stall speed is increased; when the C.G. is moved aft, stall speed decreases. Exceeding the C.G. envelope in either direction will create serious stability problems.

• How does turbulence affect stall tendencies? Encountering a vertical gust brings about an abrupt increase in angle of attack, which could result in a stall.

• Uncoordinated flight does not affect the stalling speed of an airplane. Wrong! Slips or skids cause a turbulence in the airflow over the wing, which weakens lift, increases stalling speed.

• Even a light accumulation of frost, snow, ice, or caked mud on the wings can raise the stall speed significantly. Right! Any build up of foreign matter on *either* surface of the wing disrupts the smooth flow of air over it, requires a higher than normal angle of attack to maintain altitude and increases the stall speed.

A stall can occur at any altitude, but its occurrence will lead to an accident only if recovery cannot be completed before striking the ground. It would seem logical that most serious or fatal stall-spin accidents would result from a stall initiated near the ground, usually in the landing or takeoff phase of flight. Nevertheless the NTSB study of stall-spin accidents from 1967 through 1969 showed that in 40 percent of the accidents the stall originated at altitude, or "inflight." Most of these accidents were associated with such operations as aerobatics, buzzing, low passes, crop dusting, search and rescue, cattle roundup, coyote hunting, VFR flight into IFR conditions, etc.

Losing the Horizon

Loss of the horizon as a visual reference is a condition that can easily lead to an inadvertent stall on the part of a non-instrument rated pilot. In some cases he will unconsciously try to slow down the airplane, once he penetrates a cloud, while he decides what to do next and while he hesitates, peering for a patch of blue, the airplane "gets away from him." He may lose hundreds of feet of altitude before he realizes what is happening. Again, for pilots without instrument experience, recovery from a stall without a visible horizon is often impossible. The negative "G" sensation that accompanies the onset of many a stall is confusing to the pilot's physical sensations, and may temporarily confuse his mind as well. Leveling the wings may be a problem; or the wings may be leveled in an inverted position; or the nose may be pulled up so quickly on recovery that a secondary stall takes place, with further loss of altitude.

Although hunting from an airplane is now illegal, use of the aircraft by ranchers for rounding up cattle, locating strays, dropping feed, etc., is becoming a common practice. Since these operations involve slow flight at low altitudes and diversion of the eyes to distant objects on the ground, the possibility of the inadvertent stall is ever present.

All pilots practice recovery from stalls when training for the private pilot's license, but how many ever continue this practice on their own? (When did you last spend half an hour at it?) The operations that the pilot conduct routinely in the course of flying his airplane increase his skill and sensitivity, but those which he merely keeps in the back of his mind, like stall recovery, grow rusty with time. The argument is sometimes made that since most fatal stall accidents occur near the ground, there is no point in maintaining your skill at recovery from stall with minimum loss of altitude. The fact is that the difference of a few feet in the altitude lost in a stall recovery can make the difference between a safe landing and a bloody mess. It is hard to think of a better argument for practice.

Both VFR and IFR pilots should spend some time regularly practicing recovery from stalls in simulated instrument conditions, naturally in the company of a safety pilot or instructor. If you want a frank opinion of whether you can do this maneuver safely, go up for a voluntary proficiency flight with your Accident Prevention Specialist or Counselor.

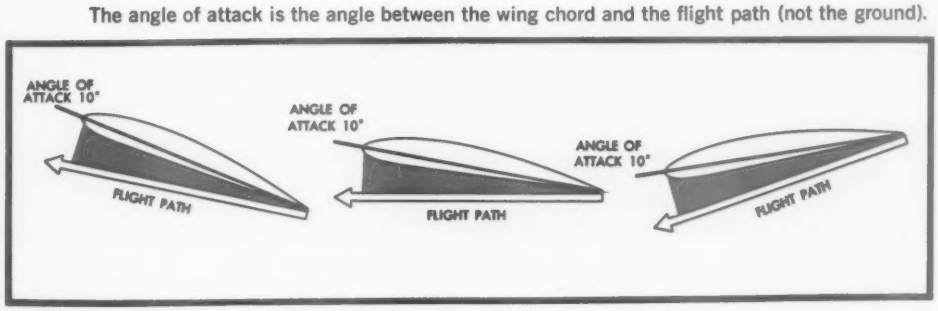
Most passengers are not wild about sitting through stall recovery practice, but it is a good idea for the pilot to get the feel of the airplane in stalled conditions with a full load on board. Properly secured ballast in the rear of the cabin will simulate full occupancy. The difference in the aircraft's behavior at minimum slow speed operations may be surprising, especially with regard to stall speed and loss of altitude. Make certain that there are no loose objects of any kind in the cabin before you take off intending to practice stalls; nothing slides forward loose bits of hardware on the floor like a good sharp stall break, and if any of this flotsam jams the controls when you start your recovery you may be in for a bad trip.

Many pilots are in the habit of turning off the stall warning horn or other warning devices (by cutting off the master switch) when practicing stalls, or even when landing, since the distraction seems unnecessary. The safest practice is to leave it be—FAR 23.207 requires it to be operative. It is better to learn to tolerate the noise than to take a chance of forgetting to restore the signal and have it fail to warn you when you need it. Most experienced pilots can tell, most of the time, when an airplane is on the verge of a stall, by the mushy feel of the controls, but if they are preoccupied with problems inside the cockpit or on the ground, that irritating horn can be a lifesaver.

The NTSB report of stall-spin accidents concluded that warning lights alone have little effectiveness, especially with VFR pilots whose attention is usually outside of the cockpit. It noted that a number of pilots involved in the accidents studied, testified later that they did not hear the warning horn —or had no recollection of having heard it.

(Editor's note: The second half of this article, dealing with spins, will appear in a forthcoming issue.)

The angle of attack is the angle between the wing chord and the flight path (not the ground).



Skyhunt

The sky is a large area to search for stolen aircraft

Late in the evening of September 7, 1972, two young men walked casually into the private hangar at the Tulsa, Oklahoma, Airport which housed a twin-engine Cessna 401. To the guard on duty they explained that they were authorized by the evangelical organization which owned the airplane to fly it. The blocks were removed, the Cessna rolled out on the runway, and a few minutes later the airplane rose in the sky following a normal takeoff.

However, there was one thing that was not quite normal about that particular takeoff —the airplane had just been stolen.

The following morning the regular pilot of the airplane discovered it was missing, and informed the owners. The Tulsa police were contacted, and in turn the police alerted the flight service station. That same morning Tulsa FSS issued a nationwide alert to all FAA facilities throughout the country, giving the stolen airplane's N-number, make and model, and point of theft.

Throughout the day of September 8, Alert Notices of the stolen Cessna were being posted in FAA facilities across the country, in flight service stations, in control towers, and in centers.

Meanwhile the missing twin, N4095Q, was being flown eastward from Tulsa in a cross-country joy ride. The pilot was 21 years old, rated only for single engine aircraft.

He put the stolen Cessna down at Little Rock, Ark., for fuel, and when he radioed the tower for approval to land, he slyly changed a digit of the N-number. Then he was off to Pine Bluff, Ark., and finally to Memphis, Tenn., his home.

After a short stay, he took off again from Memphis and now headed south, using an expired national credit card to purchase oil and fuel during his trip. On September 14 as he was approaching the airport in Alma, in southern Georgia, he called in to the FSS for the airport advisory service, giving his identification as N4090Q, instead of actual N4095Q painted on the airplane.

The departure at Alma, after refueling, made it necessary for the airplane to taxi past the FSS, manned by Acting Chief Walter Douglas and Assistant Chief Wade Carpenter. As the two men in the FSS observed the departing Cessna, they noticed the one digit substitution on the N-number. Douglas and Carpenter immediately checked the FAA Alert List of stolen aircraft and saw that the Cessna was indeed listed as stolen and missing.

By this time the Cessna had begun its takeoff roll, and it was now too late to apprehend it at Alma. The FSS notified the Jacksonville Center a stolen airplane was in the sky heading south. The Center at Jacksonville picked up the Cessna on radar about six miles from Alma, and continued to track it in the sky on its flight southward. During this whole episode it was never known to FAA's air traffic service what motivated the pilot to steal the Cessna—was it simply a joy ride? Was he attempting to sell the airplane some place far from Tulsa? Or was he attempting to fly the airplane out of the country to Cuba?

However, the stolen aircraft put down at Jacksonville, at which point the airport police, on request of the FBI, apprehended the two young occupants. The Cessna was found to be undamaged, and in December of that same year a trial was held in the U.S. District Court in Jacksonville, where the pilot pleaded guilty and was convicted of a charge of interstate transportation of a stolen vehicle.

Safe recovery of this stolen aircraft was accomplished by means of a recently expanded alert system under the jurisdiction of FAA's Office of Air Transportation Security. FAA personnel are not authorized to arrest thieves or apprehend stolen property, but to assist various law enforcement agencies by means of its broad network of communications, radar surveillance and other aspects of air traffic control. All appropriate field offices receive Alert Notices of missing or stolen aircraft, and air traffic controllers and FSS specialists keep a sharp eye peeled for them.

One of the fastest recoveries on record occurred in late 1971 when an Alert Notice for a stolen airplane issued on the East Coast resulted in the airplane being spotted and recovered at another FSS on the West Coast, almost 3,000 miles away—only 30 minutes later!

The incident began in Blountville, Tenn., where a young man had made inquiries at the Tri-City Airport about purchasing a Piper *Cherokee*. He appeared to like the airplane, and a few days later, late in the afternoon returned to the airport with a certified cashier's check for the full price: $18,746.00. The check looked perfectly in order, and a bill of sale was given. The following morning the new owner flew the airplane off into the sky, and the seller went to present the check at the bank—only to find out it was counterfeit.

The police were called in and quickly ascertained that the man who had stolen the airplane had a previous conviction for embezzlement and was, in fact, on parole at that time.

On request from the FBI, at twelve noon on November 5, 1971, the FSS at Washington's National Airport issued an Alert.

Thirty minutes later Piper *Cherokee* N27048 called into the FSS at Reno, Nevada, for a weather briefing. A quick check with the list revealed it was the airplane added to the list just a few minutes earlier. The FBI was immediately notified, and agents arrested the pilot of the airplane when he landed at Reno.

FAA's Office of Air Transportation Security estimates from its own records that over 200 airplanes have been stolen in the United States during the past two and one half years. However, this figure does not represent the actual number of airplanes stolen, since not all stolen airplanes are reported to FAA. Many stolen airplanes are quickly crashed, and in that case the police do not, of course, instigate a search for a stolen airplane.

Since FAA is not able to judge whether a missing airplane is actually stolen, borrowed or misplaced, it will not take action to help recover any craft until police authorities have been notified. (Frequently club-owned aircraft believed to be stolen turn out to have been taken by a club member as a result of some mix-up in scheduling. In other instances, missing airplanes have been taken up for testing, removed to distant ramps for overhaul, impounded by municipal authorities for local violations, etc.)

In many cases aircraft thieves will avoid large, tower-controlled airports, knowing that the identification number could give them away, and they may refuse to respond to radio inquiries from the ground, or they may give incorrect information in their response. Consequently aircraft thievery may create aviation hazards, in the form of unknown aircraft in controlled airspace. Often, as in the case of the aircraft stolen from Tulsa, described earlier, the pilot will not be rated for the type of aircraft he lays hands on, or will not be current in the type. Moreover, in his haste to avoid detection, he may blunder into the path of other traffic, or into forbidding weather.

Flight safety is also jeopardized by the prankish type of theft, involving an hour or so of "fun" in the sky on the part of irresponsible or perhaps inebriated persons. The accident record files of the National Transportation Safety Board are dotted with such episodes, many of them with tragic consequences. Stolen aircraft were involved in 45 accidents in 1971-72, of which 16 were fatal.

In March of 1972, four young men were driving around the Maryland suburbs near Washington in the early, pre-dawn hours of the morning when one of them proposed a lark: Let's take an airplane ride. It was almost four a.m. and there was rain and fog and haze in the area; but an aerial joyride seemed at the moment an exciting, daredevil sort of thing to do.

One of the young men, aged 19, had a private pilot's license, but he had only a total of 155 hours of flying time and he was not instrument rated. Five days previously he had rented a Piper J-3 at the College Park Airport, and he though he knew where that particular airplane was parked. Two of the young men got out of the car at College Park, and the other two drove off toward Montgomery County Airport some 20 miles away, where they would meet their friends after the daring flight.

The two young men found the Piper tied down but not locked, and they climbed in. The airplane was started (many earlier models of aircraft need no key to start the engine.)

It was definitely IFR weather; the Piper was not equipped for night flying; there were no lights, and no attitude or radio directional instruments. Nevertheless, the young pilot and his passenger took off in the haze. It quickly became obvious that he could not handle the airplane in the prevalent adverse weather conditions. Just 12 minutes after takeoff, at 4:42 in the morning, he crashed into some trees and plunged to the ground, hitting a sidewalk in front of a large lawn. The two young men were killed on impact, and the airplane was destroyed by fire. They had crashed on the lawn of a sorority house one-half mile west of the University of Maryland but fortunately no one else was hurt.

Another joy ride in a stolen airplane was taken by two young men on the evening of January 28, 1972, at the Vacaville, Calif., Airport. They approached the airport shortly after 10:00 p.m. and found an airplane which had been parked there by the owner who was trying to sell it. The cabin door was locked, and the airport manager had taken the key home with him. However, the young men were able to get into the Piper J4E by working open a side window and then reaching down to the inside latch. They were able to start the airplane without a key, and it was later found that toggle switches were hooked up to the battery and magneto switches.

This time the flight lasted 15 minutes. The NTSB report said there was "an alcoholic impairment of efficiency and judgment", and the pilot struck high voltage lines about two miles north of Vacaville. The passenger died on impact, and the pilot died a few hours later in a hospital.

A different kind of flight in a stolen aircraft occurred at the Monticello Municipal Airport in Arkansas in June of 1972. In that episode a student pilot went out to the airport about midnight and used a key from another plane to get into an airplane parked there. He managed to get it started and airborne.

A chase plane was sent up, and the police continued to talk to the pilot from the ground, but to no avail. They heard him say, "It sure takes long to run out of gas—the peg's been on the bottom for 15 minutes." The airplane was circling the airstrip at 5:55 a.m. when the engine finally began to miss. Over the radio was heard: ". . . she's starting to miss—that's it, it's all over." The airplane crashed at the end of the runway, killing the pilot instantly.

In recent years FAA personnel have become more sensitive to suspicious behavior on the part of pilots—unusually early or late arrivals (when the tower may not be operating), taxiing carefully out of sight of an FSS window, slight unevenness in the color of the painted numbers, etc. But the basic protection against criminal activity is the Alert Notice, which is credited with having led to the recovery of six to eight aircraft within the past year. The best protection against pranksters and unbalanced persons stealing your airplane is an attitude of security consciousness.

Do Not:

- Allow your keys to be left on an office pegboard.
- Park your airplane and leave it unlocked.

Do:

- Invest in foolproof locks.
- Tie your airplane down *only* where there is all night surveillance. ■

If the tiedown area is not attended full-time, try to park your aircraft in plain view. Lock it up and take the key—a handy key hiding place for you may be handy for thieves as well.

Penalty For Change Of N Number.

The FAA Act of 1958, section 902, makes it a crime to change the I.D. number on an airplane without authorization. The penalty: Up to 3 years in prison or $1,000 in fine, or both.

It takes a lot of faith to move mountains, but a little misplaced faith in an outdated Sectional can have a similar effect. Consider the following incident, which took place near the Chiricahua Mountains of southern Arizona.

A pair of housewife/pilots from Kansas City, Mo., were on their way to the "Aeroclassics" air race in Palm Springs, Cal., in a *Bonanza*. On the 250 miles segment from El Paso to Tucson they were flying from omni to omni and following the ever-present railroad tracks west. Midway on the leg the country became mountainous, the tracks swerved southwesterly, and they were left to follow Victor 16 on to the Cochise (Arizona) VOR. A glance at Chiricahua Peak (9,796′) at the left, and Cochise Head (8,-109′) at their right soon convinced the ladies, who were flatlanders by birth, that the waning daylight would not last long enough to see them safely into Tucson that day.

A look at their chart showed them that Bisbee-Douglas Airport lay only 30 miles away, almost due south, with a VOR about four miles west of the airport. Their calculations indicated that following the 190 degree heading inbound would allow them to descend at a safe distance to the west of Swisshelm Mount, a 7,000′ promontory about 15 miles north of the airport.

Out of respect to the presence of other isolated peaks in the area, and the weakening light, they kept the omni needle well centered. Nevertheless, Swisshelm Mount began *moving in front of the airplane*, forcing them to edge farther west. A purplish smoke hung over the area (from a copper smelter on the Mexican border, as they learned later), so that they could barely see the ground over the nose of the airplane. When an ugly outcropping of rock suddenly loomed up under one wing, barely giving them time to bend the airplane away from disaster, the two women decided that discretion was much more attractive than valor: they radioed the Douglas Flight Service Station and asked for a DF steer.

A few minutes later they were safely on the ground at Douglas. As soon as they had parked the airplane they paid a call upon the FSS chief, to thank him and to warn him that his VOR transmitter was unreliable.

"That's not possible," he told them. "The flight check people went over it only a week ago."

"Then you've got a moving mountain out there. We were dead on course."

"A moving what?—wait a minute. I bet I know what moved. You're lucky to be alive. Let me see your chart."

Their chart, which as he pointed out gently was two years old, showed the VOR four miles west of its present site right on the airport, where it had been relocated some eight months earlier. The women's cheeks began to assume a bright and rosy hue. . . .

Economizing on aeronautical charts is one of the most foolish of "pennywise, pound foolish" practices in general aviation, and indeed it has on occasion led to the loss of an airplane or to a healthy scare. Many pilots (especially those who remember the 30-cent charts of 1964) complain that sectional prices are high at $1.15, but it must be remembered that with the old-style charts it took 87 to cover the 48 states ($26.10 worth) while with the current series you only need 37 for the same area ($42.55)—not as great an increase as it appears at first glance. A typical chart of today covers an area of about 360 miles by 280—more than 100,000 square miles!—and remains current for six months after issue.

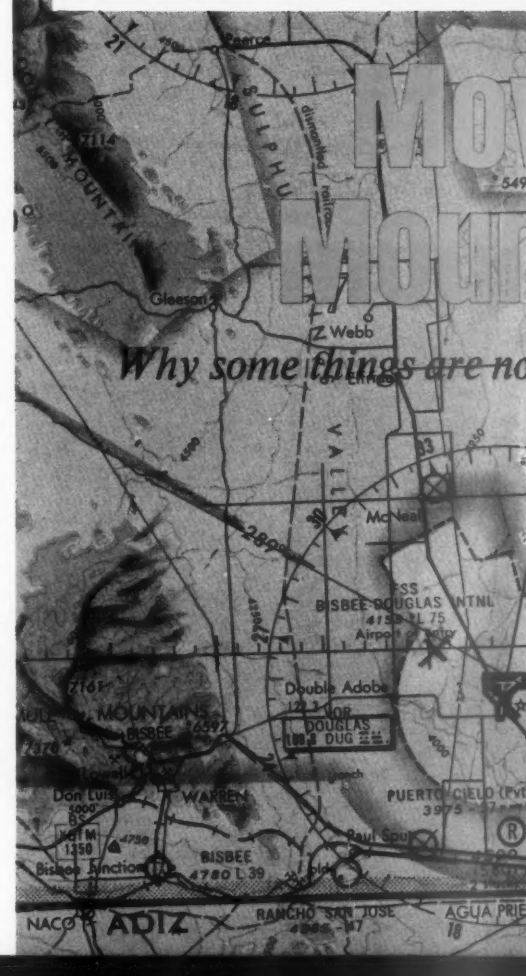
When you consider the total cost of the average airplane journey, the price of a new sectional adds only negligible expense. Suppose that several times a year you rent a well-equipped VFR plane to fly your family back home to visit Grandma, 300 miles each way. Whether you take a moderate-speed four-place fixed gear ($22 per hour wet, 120 mph) or a somewhat faster, more expensive retractable ($28 per hour, 150 mph) it will cost you about $110 each trip for airplane rental. If you own your plane, the hourly costs may be less—or more—depending on the type and age of the plane, your fixed expenses and the hours you fly annually.

In either case you can probably make your 300-mile flight with no more than two charts. Even if you never use the charts between times (highly unlikely), their cost would average out about 75 cents per trip, or about the price of a round of soft-drinks. And 75 cents a trip is not very much to pay for insurance against getting lost or clipping a tower that does not appear on the old chart.

A Poor Gamble

Any time you start off on a flight cross-country with an outdated sectional as your principal reference source you are gambling. The magnitude of the gamble depends on how old the chart is, and how rapidly that particular area is changing. Any number of changes might have occurred without your knowledge since your chart was printed:

• *Frequency changes.* This is one of the most common of all the revisions and any new chart may contain half a dozen or more of such changes. The nav-com system comprises an ever-changing picture, mostly because of new facilities being added (control towers, new approach and departure control positions, new radar and TCA slots, ILS's, etc.). Each of these results in new frequency assignments, and often necessitates juggling other frequencies in the area as well, to eliminate possible interference with each other. Sometimes you can simply get a new frequency from the FSS or other facility with which you are in contact—if you keep your wits about you. On the other hand, if you are trying to stay beneath clouds you may be too low to reach any other station, and if the situation is already marginal and you cannot raise anyone it may be quite



disconcerting before you determine for sure that your radios are still working. And if a new control tower or terminal control area (TCA) has been established unbeknownst to you and you blunder on in, incommunicado, you may find yourself with some questions to answer when you get on the ground!

• *Airports closed, or altered.* Spotting a new airport on the ground may be confusing, but it will not harm you; however if you find, at the end of a long flight, that your intended destination airport has been closed, things could get a little uncomfortable, especially if you are also running out of daylight, fuel, and/or weather.

• *Landmarks altered.* You might be only temporarily disoriented by a new road running beneath you, but chances are you will "find" yourself if the next few checkpoints come up on schedule. A lake, which you see clearly up ahead but which you cannot find on a chart may be dismissed as inconsequential so you proceed to the next landmark. In good weather a new resort development located where none is shown on your chart might not disturb you. However, in any of these cases if the visibility is poor, and eyeball navigation is critical, a pilot could become pretty rattled. And once a pilot is convinced he is lost the troubles pile up in a hurry.

• *VOR's relocated.* If a VOR has been geographically moved but is still operating on the same frequency, as in the above example, it could involve some very serious problems if the visibility is poor. If the VOR has been shut down it might be even more dangerous, especially at night.

• *Tall towers constructed.* If you are groping about in low ceilings and marginal visibility and suddenly see a tall TV tower square in front of you it can be startling. The guy wires that support it are often more of a hazard than the tower itself, since they are so difficut to see.

Each sectional chart is updated and reprinted twice a year following a schedule that is staggered so that they do not all come out at the same time. Charts are dated with both the effective date of that chart and the date when the next chart is due to be issued, so you can quickly determine if yours is in the current edition. It is a good idea to discard your old chart when you get a new one, so that you will not grab it accidentally some day. And since sectional charts are revised only twice a year, pilots are urged to check the AIM and NOTAMS for unexpected changes, before embarking on a cross-country flight.

The sectional chart as the pilot gets it is the result of coordination between the Department of Commerce's National Ocean Survey and two branches of FAA's Air Traffic Service. One branch, the National Flight Data Center, collects and screens the flight information that is to go on the charts (VFR and IFR). The Cartographic and Technical Standards Branch is responsible for the way data is presented on the charts. The present form has evolved over many years of experience and appears to represent a good balance, including most of the data a pilot might need for VFR flight and excluding unnecessary clutter which would complicate finding anything at all.

The design of charts has always been a fair game for critics among the flying public, with some users wanting every possible detail shown and others feeling that no immediate information should be included on the topographical map itself, but that it should be used with a frequency and data sheet, which could be revised often. However, it is a generally accepted fact that pilots normally use the material most readily available (in this case the data printed on the chart), and so charts are made with the assumption that in many cases they will be the only navigational reference source in the airplane. For this reason rather complete data is printed on the face of the chart as well as on the margin and legend section. In fact, many pilots are really not aware of the wealth of information that is to be found on the chart itself.

Changing Signs

The chart-maker's work will never be finished as long as frequencies are changed, airports constructed or remodeled, TV towers installed, control towers added or the airspace altered in any way. Most of the symbols on the charts are easily recognizable, but occasionally a new sign has to be designed to show some recently conceived man-made landmark, such as the one now being prepared for designation of obstructions which are lighted with the new white-flashing obstruction lights. And a few of the symbols are seldom used, or are restricted to a particular geographic area. A new, more detailed legend panel being designed for future charts will include more seldom-used symbols such as the one for a partially submerged rock in the ocean (a very good checkpoint in an area like the Bahamas), a sunken ship, etc.

Many chart changes originate from user suggestions. As the result of one such recent suggestion the names of bordering charts will be re-instated in the future on sides and corners, to help pilots identify the next chart needed on his route. This feature was used in old-style charts but was dropped with the advent of the present series. Another innovation under study is the possibility of selling charts on a subscription basis, to do away with the problems of re-stocking for the pilot.

In the interest of keeping charts as up-to-date as possible, users are asked to notify the publisher immediately of any errors or omissions that are found. The correction should be marked right on the chart and mailed to: Director, National Ocean Survey, NOAA, Rockville, Md. 20852. Include your name and address, and a replacement chart will be sent to you—yes, free. ■

Weather Whys:

CLOUDS

This is the seventh in a series of articles prepared for FAA AVIATION NEWS by meteorologists of the National Weather Service.

Clouds are the most visible signs in the sky of nature's forecasts. Thirteen years ago, when TIROS weather satellites began photographing the earth from 450 miles in space, weathermen discovered that cloud patterns formed natural weather maps with a startling likeness to the maps prepared at weather stations around the world.

Because their location, shape and movement depend on the motion, humidity and temperature of the atmosphere, clouds convey important messages to those who understand their meaning. Early sailors relied on the warnings of the clouds; with a little study, pilots can profitably use them too.

Clouds can help the pilot make important flight decisions. They also can form a ceiling and steal the VFR pilot's visual reference to the ground. At worst, they can envelop him, leaving him trapped, confused, lost.

Weathermen divide clouds into three principal families—low, middle and high—according to the altitude of the cloud base above the ground. A fourth family, called "clouds of considerable vertical development," may extend from near the ground to 75,000 feet or more and produce all the other types of clouds.

The terms "low," "middle" and "high"' are relative and have no specific limits. However, in the United States, low clouds generally have bases between the surface and 6,000 feet, middle clouds have bases between 6,000 and 20,000 feet, and high clouds have bases 20,000 feet or more above the ground. These heights may vary with the season, the latitude and the terrain.

Cloud height has a direct bearing on icing conditions, and knowledge of the different physical makeup of low, middle and high clouds can help the pilot in his flight planning.

Low clouds are nearly always made up of water droplets. Middle clouds may be either water droplets or mixed water droplets and ice crystals. High clouds are almost always composed entirely of ice crystals.

Within the cloud families, there are two distinct and easily recognized types—cumulus and stratus. Cumulus means piled up or accumulated, and cumulus-type clouds are always lumpy like the head of a cauliflower. Generally, they appear to be much whiter than other clouds.

Stratus-type clouds are layers or sheets, generally shallow and grayish, without well-defined edges. Fog is a stratus cloud at the surface. Both cumulus- and stratus-type clouds may occur at low, middle, or high levels, and the two are often present at the same time.

The bumpy cumulus and the smooth stratus forms tell the pilot exactly what conditions he can expect to encounter when flying through them. *Cumuliform clouds—produced by rapid, sometimes irregular lifting and cooling—indicate turbulence. Stratiform clouds—produced by slower, sustained lifting—indicate smoother air.*

Water droplets are larger in the cumulus type of cloud than in the stratus type. Since larger droplets freeze more slowly, cumuliform clouds tend to cause clear or glaze icing, while stratiform clouds produce rime icing.

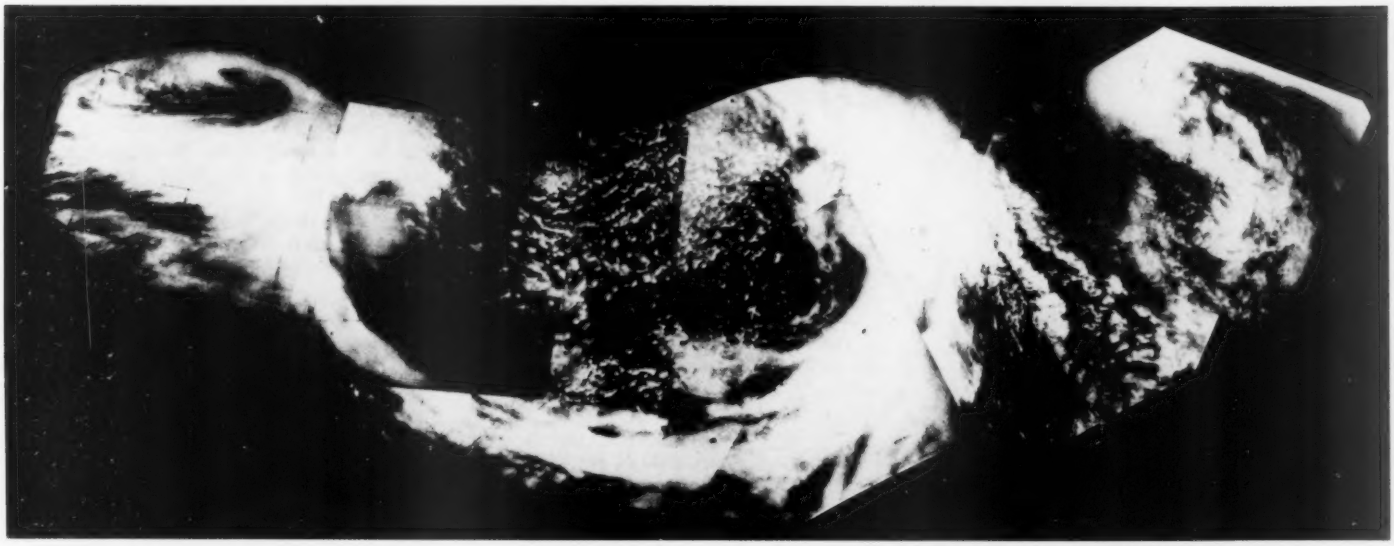
Stratus-type clouds are associated with warm fronts where air is lifted slowly up the shallow frontal slope (see FAA Aviation News, June 1973.) Cumulus-type clouds are typical of cold front activity.

A few cloud forms are considered important enough to be mentioned in aviation

Cumulonimbus mammatus may precede a tornado.

Altocumulus patches following a front.

Cloud formation photographs taken by TIROS weather satellite from several hundred miles in outer space and transmitted to stations on earth.



Expect turbulence near lenticular *roll* cloud.

Signposts in the sky for those who know the language

Altostratus up to 50,000' may follow rain.

weather reports whenever they are observed. All pilots should be able to recognize these types: *towering cumulus, abbreviated* TCU in teletypewriter reports; *cumulonimbus,* abbreviated CB; *cumulonimbus mammatus,* abbreviated CBMAM; *standing lenticular altocumulus,* abbreviated ACSL; *altocumulus castellanus,* abbreviated ACCAS; and *virga,* which has no abbreviation. Other cloud types *may* be mentioned in the reports when the observer feels they are significant to the pilot. The forms listed above must be included. All are cumuliform in nature except virga, which often occurs in association with the cumulus type of cloud. All are found at low or middle levels where most general aviation traffic moves.

Towering cumulus clouds are massive, with great vertical development and rapid growth. Turbulence associated with these clouds is generally moderate to heavy. Inside the clouds, there are irregular updrafts and no downdrafts. *A* TCU *can become a cumulonimbus or a thunderstorm in minutes.*

Cumulonimbus is the mature thunderstorm cloud, extending upward through the icing level. Thunder and lightning may accompany it, and showers may fall from its base.

Cumulonimbus mammatus is also associated with thunderstorm activity and frequently occurs in the vicinity of hailstorms. The ominous cumulonimbus mammatus with its heavy, sagging pouches, is rarely forgotten once seen.

Altocumulus castellanus, a middle-level cloud, warns of the presence of the atmospheric instability necessary for thunderstorm development. Often these clouds will appear in a nearly clear sky during the morning hours before low-level cumulus begins to form. They are similar to towering cumulus, except that the cloud elements, usually are smaller. The cloud mass is extremely changeable, with small towers or turrets constantly appearing and dissolving. Often, the ACCAS disappears before the formation of cumulus clouds, which later become the promised thunderstorms.

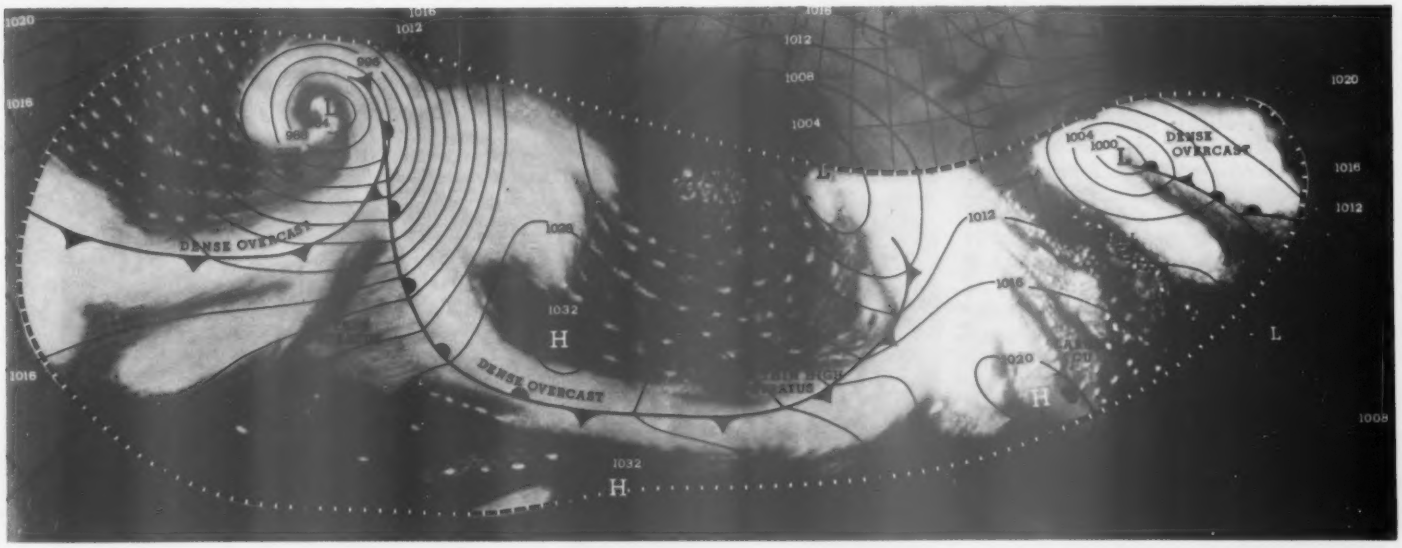
Altocumulus, standing, lenticular (ACSL) are middle-level clouds with characteristic lens or almond shapes. These unique clouds stand still while the wind blows rapidly through them. The cloud is continuously forming on the upwind side and dissipating on the downwind side. Lenticular clouds often mark the existence and location of mountain waves, which are areas of turbulence to be avoided by most aircraft.

Virga is composed of water or ice particles that fall from a cloud but evaporate before they reach the ground. Virga may occur with low or middle clouds of either the cumulus or stratus types. It sometimes resembles hair —thin and curled at the lower end, heavier and straighter near the cloud base. *Virga often precedes the onset of precipitation, and pilots should be alert for lowering visibilities and ceilings.*

Pilots should not minimize the hazards of stratus-type clouds just because observers are not required to report them. Stratiform clouds are generally more extensive and persistent than cumuliform clouds, restricting visibility over large areas for long periods of time. They may bring continuous precipitation, although usually lighter than that associated with cumulus-type clouds.

Widespread stratus-type clouds may appear quite suddenly over one or more airports in a matter of minutes. In flight, decreasing visibility—caused by increasing moisture in the air—often precedes stratus formation. When objects on the ground begin to seem fuzzy, the pilot should prepare to change his flight plan. A PIREP, as well as a check on the weather, is in order if increasing amounts of stratus clouds are encountered contrary to forecasts. ■

Same TIROS cloud photographs as on opposite page, superimposed on conventional weather map, show storm building up over the North Pacific.



Famous
FLYERS

Lawrence Hargrave

The SUNDOWNER and the kite plane

Lawrence Hargrave (courtesy QANTAS)

After several hundred years of human effort to fly, either with the aid of birdlike wings or by means of inflatable bladders, a radically new idea was born in the mind of an Australian self-taught mechanical genius: the box-kite as an airfoil. Whether Lawrence Hargrave actually invented this form of kite is of little moment. What is significant is that he developed the design into the basic wing structure of the airplane, severing once and for all the time-honored but frustrating dependence on birdlike structures for human flight.

Lawrence Hargrave was born at Greenwich, England on January 29, 1850, the son of a lawyer who later emigrated to Australia. The boy followed, at the age of 16, left school and went to work for the Australian Steam Navigation Co., a shipping and shipbuilding firm in Sydney. In the company drafting room and workshops, Hargrave displayed an uncanny knack for mechanics, and absorbed knowledge rapidly from practical experience. After knocking about the back waters of New Guinea for several years, he married and settled down in Sydney, assuming the post of Assistant Astronomer at the Sydney Observatory. Here his work with air currents sparked his interest in a subject that was to become his life passion—human flight.

In 1883, when he was only 33, and supporting a family of five, he resigned from the Observatory in order to spend full time experimenting with "supporting surfaces." Like many of his predecessors in the field, Hargrave began with "wing-flapping" devices and gliders with birdlike wings, but soon discarded these. Most of his experiments were carried out with model aircraft not large enough to carry a human being. Many were propeller-driven, powered by rubber bands, steam, or compressed air. After nine years of intensive work he was convinced that powered flight was possible and that the major remaining problem was achieving stability with the supporting surfaces (wings).

In 1904 he constructed a full-size hang-glider in the style of Lilienthal (the "Batman of Berlin"—see FAA Aviation News, July 1973) and tested it himself. A destructive crash (fortunately without injury to the pilot), following a crosswind upset, led Hargrave to the conclusion that birdlike wings were inherently too unstable for human flight.

He then gave undivided attention to a design he had been working on for several years: the box kite. Kites had been built by man since the earliest days of civilization, of course, and by the 19th century it was well understood that the kite stayed aloft because it consisted of a plane inclined against a windstream. The kite took many forms, some bird or animal-like, but always it was a single plane. Beginning in 1892, Hargrave began to test kites made up of cells, open box-like structures, braced internally and covered with cotton or other light material. Two or more cells were attached to a spar, to which the kite-line was fastened.

The Australian inventor theorized that the cells in tandem would provide greater stability to the whole than flexible, winglike planes, as well as greater lift than a single plane, and experiments proved him right.

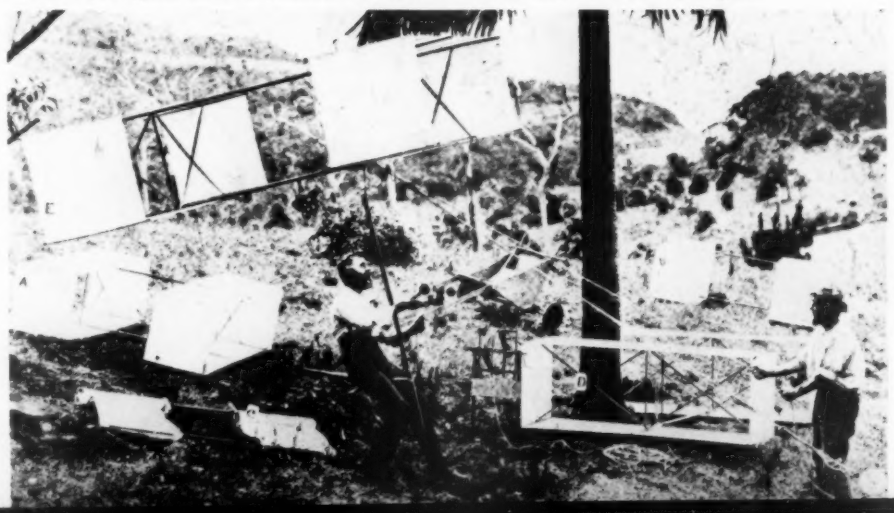
In 1894, a four-cell Hargrave kite plane weighing 34 lbs. lifted a gross load of 208 lbs. The achievement was described by Alexander Graham Bell, then President of the National Geographic Society in the United States, as "the highwater mark of (aeronautical) progress in the 19th century. . . ." Hargrave traveled to the United States and to Europe to acquaint other inventors with his findings, and to exchange views. Although living on very limited funds, he refused to patent any of his designs and consistently advocated the free exchange of scientific knowledge. He felt that once the technological breakthrough in flight was achieved, financial regards would flow naturally to the best craftsmen, rather than to those who appeared first in the field.

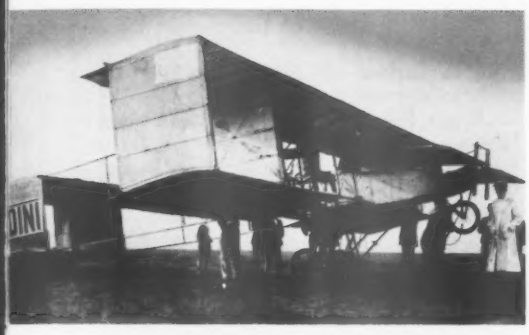
Returning to Australia, Hargrave resumed experiments with airfoil surfaces begun several years earlier, when he had observed that the curved sails of a windmill revolved freely in a light wind, even when the sails were turned on their axes so that they were in line with the windmill shaft. Using smoke to test air movements, he designed rigidly curved surfaces (which he called "propellers") for his box-like wings, and demonstrated that a kite so equipped flew at a much greater height above ground, with the same length of tether and same wind velocity, than one with flat planes.

Satisfied that the problem of appropriate supporting structures had been solved, Hargrave now turned his attention to a power source. Between 1896 and 1904 he designed and built some 20 engines, including six full-size engines designed to lift man-carrying aircraft. Power sources included steam, compressed air, gunpowder, and petroleum—one design was actually a version of jet propulsion. Every engine was meticulously crafted and bench tested—and every one was a failure. They simply did not produce enough thrust for weight, despite the ingenuity of the designer, who is credited by many sources with having originated the rotary engine during this period—an engine later developed and used with great success during the first decade of powered flight.

Throughout this trying period Hargrave faithfully reported the results of all his experiments to the scientific world community, in large part via Octave Chanute, the Paris-born American engineer who served as an international communications clearinghouse for the exchange of aeronautical information. Through Chanute, the Wright brothers, who

The use of boxlike airfoils in combination produced high lift and good stability. Isolated in Australia, Hargrave failed to produce a successful aircraft only for lack of an engine.





First aircraft to fly in Australia (1910) a French *Voisin*, followed Hargrave's basic design.

began to experiment with gliders at the turn of the century, became aware of the work being done by the lone investigator thousands of miles away in Australia.

In January of 1904 Hargrave received a letter from Chanute informing him of the successful powered flight achieved in December at Kitty Hawk. The news spurred him on to further efforts to build a workable engine, but after two more years and the failure of engine design Number 26, he gave up, citing in a letter to Chanute the needs of his family and lack of funds. No doubt he was also galled by the lack of support and occasional sneers from his own townsmen in Sydney, commenting that . . . "the first man who paddled astride a log was thought a harebrained fool by his contemporaries."

Ironically, the first public demonstration of a heavier-than-air, man-carrying flying machine (Santos-Dumont, Paris, 1906) embodied the Hargrave (nonpatented, of course) box-kite wing, but the Australian was neither present nor recognized for his contributions. Other successful aircraft designers, both in Europe and America, benefited immeasurably by the greater stability of this type of lifting surface, which lent itself readily to manual controls in the tail and wing, as Hargrave had predicted. The Australian could only stand by at a distance and watch his dreams take flight. In 1910 the first aircraft to fly in Australia (piloted by the American magician, Harry Houdini!) was a box-like winged *Voisin*.

Lack of local recognition soured the last years of his life, as his own government was slow to accept his various models and aircraft parts for display in museums. The bulk of these items eventually went to a museum in Munich, Germany, where the scientific import and originality of his work were better appreciated. Nevertheless Hargrave insisted to the last that invention had its own undeniable satisfactions . . . "a sort of inspiration and a pleasure that does not seek to be rewarded."

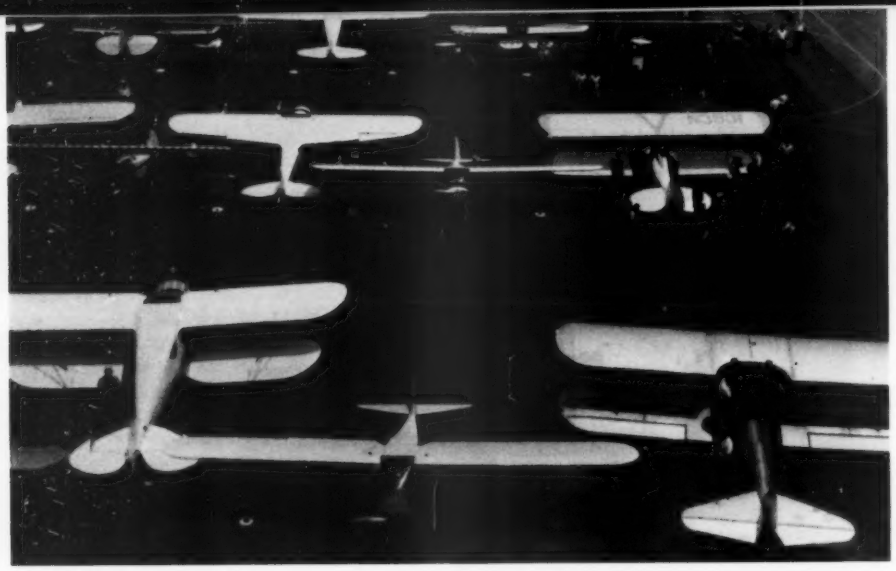
He died in 1915 of peritonitis, saddened by the death of his son two months earlier in WW-I. ■

■ HOME BUILTS FOR HIGH SCHOOLS. More than a dozen high schools around the nation have completed airplane building projects in their science and industrial arts classes. Educators have found that a variety of subjects can be worked into the curriculum, including mathematics (figuring weight and balance, fuel consumption, wing loading, etc.) English (vocabulary and composition), history, social studies and career guidance.

Most high school shops have the tools that are needed to build an aircraft, and the work involved is within the ability of most high school students. Schools interested will find helpful information in an FAA Advisory Circular, which includes suggestions on what to build and where to get materials, where to find assistance, (FAA offices, state aeronautical commissions, and amateur-builder organizations are listed), helpful advisory circulars and pertinent FARs, and a section of questions and answers. For a free copy of AC 20-86 "Aviation Education Through Building an Airplane" write DOT Distribution Unit, TAD 484.3 Washington, D.C. 20590.

■ REVIEWING PART 61. FAA has prepared an Advisory Circular on the changes to Part 61 that affect airman certification, as revised on January 25, 1973. The general effective date of the revisions is November 1, 1973. However, between November 1, 1973 and November 1, 1974 applicants for pilot certificates or ratings will be obliged to meet either the present requirements of part 61 (as updated through Transmittal 10, Volume IX of the FARs) or the revised version. Questions regarding the new requirements should be addressed to local FAA Flight Standards District Offices, which have been thoroughly briefed on the subject. The explanatory Advisory Circular (AC No. 61-65, Part 61 Revised Certification: Pilot and Flight Instructors) is being sent to all subscribers to Volume IX, and to aviation trade organizations as well as FAA field offices. Individual copies are available free from the DOT/FAA Distribution Unit, TAD 484.3, Washington, D.C. 20590.

■ FOR EMERGENCY USE. New FAA regulations have been adopted which amend FAR Part 121 and require regular inspection of all emergency equipment carried on scheduled and supplemental air carriers and by commercial operators of aircraft over 12,500 lbs. The new rule covers emergency evacuation equipment (escape chutes, etc.) and ditching equipment (life rafts, preservers, portable radio transmitters). A previous rule required inspection for basic emergency equipment such as fire extinguishers, power megaphone and first aid equipment.



SPORTING WINGS. The fleet of sport aircraft in the United States is growing impressively, according to attendance figures at this year's Experimental Aircraft Association Convention. The 21st annual meet, held in Oshkosh, Wis. from July 29 to August 4, had a total registration of show aircraft of 1,120, compared with 929 in 1972. These included 391 "custom built" planes, 173 "vintage", 406 "classic", and 100 warbirds. Campground population totalled 20,000.

System for Describing Aircraft Noise Developed by FAA

FAA has developed a new "Aircraft Sound Description System" to fill the need for a practical, uniform, technically adequate and generally understandable method of describing aircraft noise exposure. This need has been intensified by the combined effect of recent Federal legislation requiring the filing of environmental impact reports by sponsors seeking Federal funds to assist with airport projects.

The new system more adequately predicts actual impact on people living near airports or flight paths because it considers that social, economic and psychological factors are as important as abstract noise exposure values.

The principal feature of the new descriptive system is that it considers the total amount of time that noise levels exceed a predefined value at various locations relative to the airport.

FAA will begin immediately to use the new sound description system, and after July 1, 1974, it must be used by everyone submitting noise analysis studies to FAA. Advisory Circulars providing general guidance on the new system are being prepared by FAA's Office of Environmental Quality, which will send teams around the nation to explain procedures and answer questions. Complete details will appear in this magazine.

Maintenance Symposium Scheduled in December for Washington, D.C.

"Managing for Airworthiness and Reliability" is the theme of the Ninth International FAA Aviation Maintenance Symposium to be held at the Shoreham Hotel in Washington, D.C., December 11, 12, and 13. The three-day session will deal with new maintenance processes and procedures for airframes, systems, powerplants, accessories, devices, avionics/electronics and associated equipment.

More than a thousand persons are expected to attend from the United States and foreign countries. No attendance or registration fees are charged and anyone having an interest in aviation maintenance is invited to attend.

Papers to be presented at the meeting are being handled by FAA, AFS-300, 800 Independence Ave., S. W., Washington, D. C. 20591. Phone (202) 426-8441. Facilities for company exhibits will be provided by the Shoreham Hotel, but managed by FAA.

G. A. Safety Meet at Princeton

A conference on general aviation aircraft safety will be sponsored jointly by FAA and Princeton University's Aerospace Sciences Department, October 24-25 at Princeton, N.J. Items to be discussed during the two-day meeting include the lightplane accident record, research and development programs in the airworthiness and crash survivability areas, economic forecasts, and certification and regulatory trends.

The conference also will feature displays and demonstrations of new research planes at Princeton University's Forrestal Airport. Registration fee of $50 covers the luncheon and banquet plus conference report and incidentals. For further information contact Administrative Director, Princeton University Conference, New South Building, Princeton University, Princeton, N.J. 08540. Phone (609) 452-3372.

Fog Dispersal Studies Continue

FAA's warm fog dispersal project has moved into the second phase at Greenbriar Valley County Airport, Lewisburg, W. Va., where the effectiveness of glycerin as a seeding agent when sprayed into the down-wash of a helicopter will be tested. First phase experiments conducted at Arcata, Calif. concluded that seeding with glycerine was a promising method of dispersing warm fog.

A 30-day flight test will be carried out in a Bell *Ranger* helicopter equipped with a 1,000 pound capacity tank for carrying the heated glycerine and particulators for dispersing it. The Greenbrier site was chosen because of its high fog frequency in September and because a helicopter takeoff site above the fog tops is located nearby. Results of the study will be issued by FAA early in 1974.

FLIGHT INSTRUCTOR REFRESHER COURSES

DATE	LOCATION	SPONSOR
10/16-18	Columbia, S.C.	AOPA & S. C. Aero. Comm.
10/16-18	Santa Monica, Calif.	Los Angeles 99's
10/23-26	Stillwater, Ok.	Oklahoma Aero. Comm.
10/30-11/2	Gaithersburg, Md.	AOPA & Md. State Av. Comm.
10/30-11/2	Jackson, Miss.	Miss. Aero. Comm.
11/6-8	Raleigh, N.C.	State of N.C.
11/6-8	Oshkosh, Wis.	Wisconsin DOT
11/13-15	San Diego, Calif.	Texas Aero. Assoc.
11/13-15	San Angelo/Odessa, Tex.	AOPA & San Diego 99's
11/27-29	Liberal, Kans.	Seward County Comm. College
11/27-29	Callaway Gardens, Ga.	AOPA & Ga. DOT
12/4-6	Fresno, Calif.	AOPA & Fresno 99's
12/4-6	Anchorage	Alaska Trans. Comm.
12/11-13	Lincoln, Neb.	AOPA & Nebraska Dept. of Aero.
12/11-13	Honolulu	Hawaii DOT
12/18-20	Grand Forks, N.D.	N. D. Dept. of Aviation
12/18-20	Daytona Beach, Fla.	AOPA & Embry Riddle

All above are Flight Instructor Refresher Courses, designed for airplane and/or instrument-airplane instructors.
Please contact sponsor to confirm course, exact dates, and location.

FAA Aviation News welcomes comments from the aviation community. We will reserve this page for an exchange of views. No anonymous letters will be used, but names will be withheld on request.

• New Landmark Symbol

I would like to suggest that ski lodges be indicated on sectional charts. Many times, while flying in northern Michigan, I have noticed ski lodges visible in the summer for miles as a bright green patch. In the winter this same patch is much more prominent with white snow. With many lodges using artificial snow making equipment, these white patches show up even more prominently against the brown winter terrain.

I would like to suggest a quarter inch diameter green dot, with the ski lodge name under it. This should also help some ski enthusiasts, who fly their own planes, find airports near to ski lodges.

Jim Liska
Dearborn Heights, Mich.

Your idea has been passed along to FAA's map markers for consideration.

• Aviation Education

What booklets and pamphlets are available from your office for distribution to my aeronautics ground school class? I have 30 students in my class and will appreciate any materials which you can supply.

Dr. V. R. Nelson
Sioux Falls, S.D.

The Aviation Education Programs Division, AGA-300, FAA, 800 Independence Ave., S.W., Washington, D.C. 20591, provides a useful selection of aviation literature to schools on request.

Regional and local FAA offices also stock a small quantity of FAA's aviation education materials and will respond to inquiries for information on aviation education.

Direct requests for specific material may be sent to:

DOT/FAA Distribution Unit, TAD-484
Washington, D.C. 20591

• Logging Co-pilot Time

On cross-country flights in single-engine aircraft, if I perform such tasks as navigation, communication and fuel management while the pilot-in-command flies the aircraft, may I log this time as second-in-command or co-pilot time?

Robert Rosenkrantz
Schenectady, N.Y.

A pilot may "log" second-in-command time under the circumstances you describe. However, this time may not be applied toward the experience requirements for a higher pilot certificate or rating unless the pilot holds a private or commercial certificate, and at least one of the following conditions prevail: (1) The aircraft is type certificated for two pilots, and/or (2) the operation being conducted requires a second-in-command (such as air taxi, commercial instrument, etc.) Except toward an ATR rating a pilot may be credited with not more than 50 per cent of that kind of flight time toward the total flight time required for the higher license. A private pilot may not be credited with more than 50 hours of this type of flight time for upgrading his certificate. Incidentally, during simulated instrument flight a properly rated safety pilot may also log that time as second-in-command.

• Water-Wary Wife

Picked up my husband's FAA Aviation News, August 1973, to glance through it. I was delighted to find the article, "Lake Reporting Service," and can assure you that is one of the first things he will see when he returns home today.

The first paragraph alone underscored my biggest argument against doing ANY flying over ANY of the Great Lakes—the chances of help getting to you in a matter of minutes are virtually non-existent He is an instrument rated pilot, flying a twin, with over 1300 hours logged, and is an excellent pilot. Therefore, he becomes quite unhappy with me when I insist that a planned flight to Wisconsin or Minnesota NOT be routed across Lake Michigan. You have probably hit on the key reason—pride—which is probably justified in his case.

But things can, do, and have happened to the best of pilots, and I have no desire to test the efficiency of your Great Lakes Reporting Service and the Coast Guard rescue services!

(I don't even like to fly north of Chicago, over the shoreline, and that "Common One" departure out of O'Hara, which puts you out over the water, before turning inland, was experienced on an overcast day when I was occupied with other things and didn't pay attention to our heading!).

Thank you for listening to a non-pilot wife, who knows enough about what is going on to be thoroughly frightened over water.

Judith W. Burroff
Hoagland, Ind.

• Missed Questions

I have a suggestion concerning FAA written exams. I think the examinee should get a complete list of all questions missed, so that he could sit down with someone from his GADO office and go over them. Of course no copying of questions would be allowed. The present policy of just revealing the subjects where the applicant proved weak does not seem to me to be too effective.

Lester H. Vogt, Jr.
Euclid, Ohio

Missing a question or two on a given topic often means that the applicant has a poor understanding of the entire subject and should review it. Any GADO inspector will be glad to offer such assistance as is needed. Providing applicants with detailed lists of questions (and answers) missed on a test is considered a risk to the security of the tests, especially if they are also supplied with the correct answers. Since some 250,000 written tests (100,000 for private pilots) are administered by FAA each year, a manpower problem is also involved, as is the computer programming used for grading.

• Another Downed Goose

Your article in the June issue "Public Eyes" covering the two crashes of the Grumman *Gooses* (*Geese?*) is wonderously revealing to me since I am a survivor of an earlier Goose crash in the Caribbean and have been mystified ever since as to why our two engines stopped simultaneously.

The fact that only two crashes were mentioned leads me to believe that perhaps you have no record of that first one, February 12, 1960 off the coast of Jamaica. The plane sank in 5,000 feet of water and I swam four miles to shore with two broken legs.

Richard L. Bare
Los Angeles

• Centerfold Suggestion

With regard to preserving the "Alert List" of stolen aircraft, I suggest you print it on pocket-size 3 x 5 card stock and insert it in the centerfold of the magazine, attached with one staple. It could then be easily removed without cutting or destroying the magazine, and card stock would be better suited for pocket or wallet.

Vern N. Green
Anchorage, Alaska

Worth looking into. We will check out the cost of such centerfold addition.

• Marking the Spots

I have a suggestion that I think would help increase safety on landings and takeoffs. Paint three lines across the runway—one at the halfway mark and one at each quarter mark. On takeoff this would help the pilot determine the necessary runway length needed for different elevations, weather and weight conditions. In addition, and more important, it would help him determine the point at which to abort, if necessary. On landing it would help him judge the one-third needed to assure a safe landing and, conversely, clearly indicate a go-around situation.

Harold Jacobs
Chicago

We have passed your suggestion on for consideration by the FAA Airports Service, which sets airport design and construction standards. Many airports do have markers beside the runways, clearly visible from planes on the runway, telling how many feet of runway are remaining. These markers are not required equipment, however.

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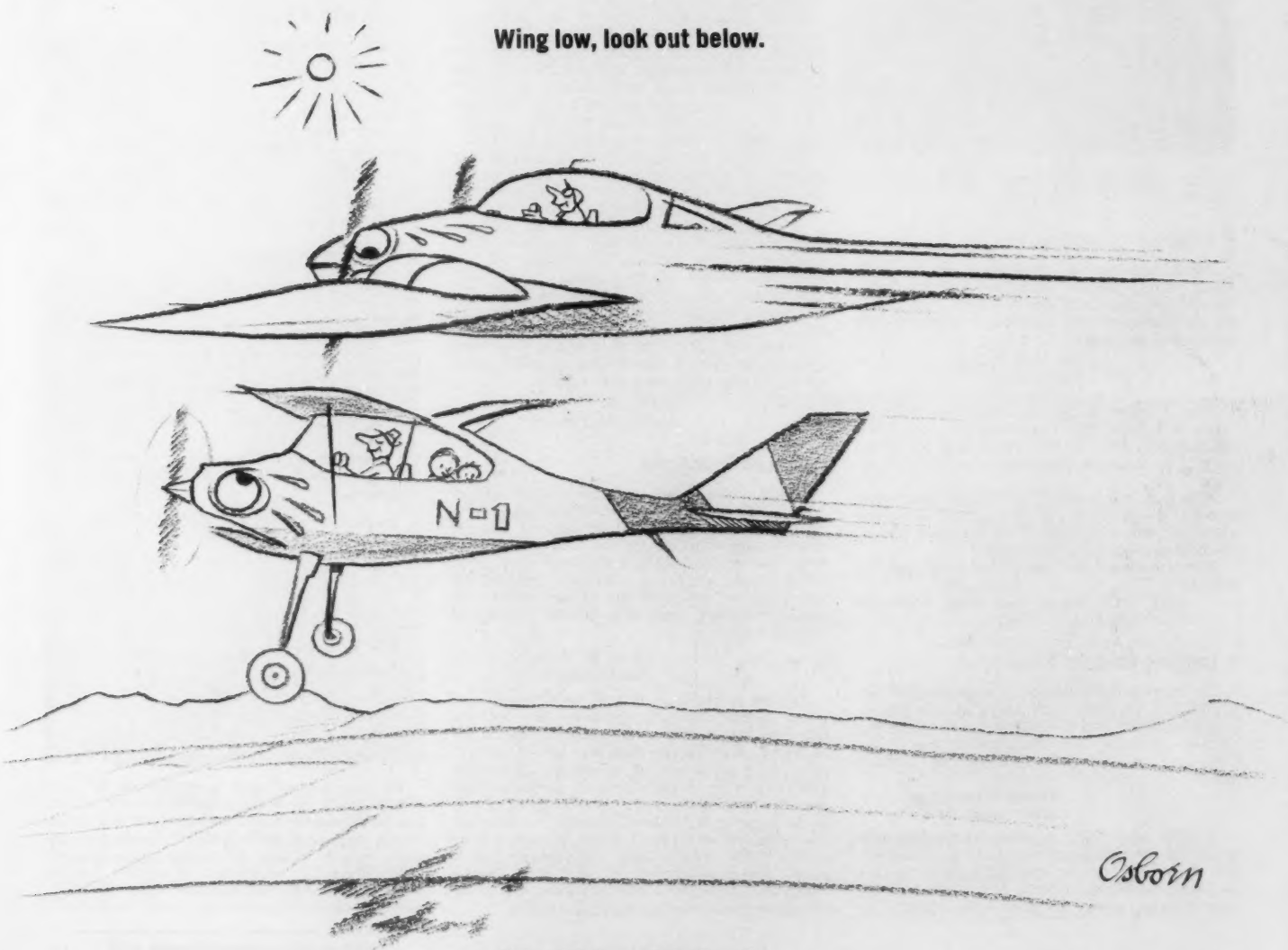
Wing low, look out below.



Wing high, watch the sky.

Suggested by Jerry Baker
ATCS, Fort Worth Center, Texas